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# A Study of the Relationship of Socioeconomic Status & Student Perceptions of School Effectiveness to Academic Achievement of Engineering Students

Geronimo Mendoza Meraz

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A STUDY OF THE RELATIONSHIP OF SOCIOECONOMIC STATUS  
AND STUDENT PERCEPTIONS OF SCHOOL EFFECTIVENESS TO  
ACADEMIC ACHIEVEMENT OF ENGINEERING STUDENTS

A Thesis  
Presented to  
The Faculty of the College of Education  
Western Kentucky University  
Bowling Green, Kentucky

In Partial Fulfillment  
of the Requirements for the Degree  
Master of Arts

by  
Geronimo Mendoza Meraz  
July 1983

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ACADEMIC ACHIEVEMENT OF ENGINEERING STUDENTS

Geronimo Mendoza Meraz

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The purpose of this study was to examine the relative contribution of socioeconomic status and student perceptions of school effectiveness to academic achievement in engineering students. The variables representing the general factor of socioeconomic status were 1) father's occupation, 2) father's schooling, 3) mother's schooling, 4) family income, and 5) family's community population. The variables representing student perceptions of school effectiveness were: 1) help seeking factor, 2) professional preparation factor, 3) experience factor, 4) outside classroom activity factor, 5) personal encouragement factor, and 6) delivery factor.

A questionnaire was developed for this specific study and was completed by 110 senior engineering students from the Durango Institute of Technology in Durango, Mexico.

Data were analyzed by means of a truncated component regression. The results of the data analysis indicated that the compounded set of socioeconomic and school factors was significantly related to student achievement, although all factors together explained only 18 percent of the total variance in student achievement. Socioeconomic status by itself did not have a significant relationship with academic achievement of engineering students. Also, the results of the data analysis indicated that professional preparation and personal encouragement had

the greatest degree of relationship with student achievement of the six school factors representing student perceptions of school effectiveness. The other school factors--help seeking, experience, outside classroom activity, and delivery--were not significantly associated with academic achievement.

## CHAPTER I

### INTRODUCTION

The expansion of educational services to an evergrowing population, the expenditure of large amounts of money on education, and the social necessity to extend the educational benefits to all the social classes have focused the attention of educators, decision-makers, and parents on the problem of school effectiveness. Increased demand from the citizenry for accountability of schools has forced educators and behavioral researchers to develop methodologies for the evaluation of the effectiveness of educational programs and practices in relation to academic outcomes, usually measured in terms of student achievement.

School effectiveness reveals the importance of the objectives of the school as a social institution: it permits us to assess the impact of school on students in their cognitive development and in the acquisition of values and attitudes toward society. However, these effects of schools depend on the availability of certain inputs. William G. Spady considers that "... the impact of schools depends on the quality of resources, staff, programs, and facilities that are made available to students from certain regions, localities, neighborhoods, ethnic groups, or social class backgrounds."<sup>1</sup>

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<sup>1</sup>William G. Spady, "The Impact of School Resources on Students," in *Review of Research in Education*, ed. Fred N. Kerlinger (Itasca, Illinois: Peacock Publishers, Inc., 1973), p. 136.

In recent investigations, however, the process of teaching-learning has been considered beyond the single and unique classroom, and has been studied as a complex process affected by internal factors and by dimensions of social factors. In effect, James E. Allen, in considering the definition of an expanded concept of education, affirmed that

. . . education can no longer be structured merely as a function of the traditional classroom or school building, but rather as an endeavor that includes and must consider the total environment in both its negative and positive aspects.<sup>2</sup>

At the same time, and although the demand for school effectiveness is not a new idea and has produced some considerable results, the rationale for using empirical data as a crucial variable in decision making is new. In dealing with the evolution of the concept of school effectiveness, Madaus, et al. affirmed that until the 1950s,

It was the exception rather than the rule . . . to obtain empirical data as a basis for decision making. For the most part, it was the opinion of "experts" or "informed" people and interested parties that formed the basis of evaluations and recommendations for change.<sup>3</sup>

However, in the decade of the 60s this situation began to change, and many empirical studies gave decision makers and educators enough factual data to evaluate how the schools are doing. In particular, the so called Coleman Report<sup>4</sup> provided important insights about the kinds of

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<sup>2</sup>James E. Allen Jr., Foreword to The Teacher's Handbook, by Dwight W. Allen and Eli Seifman (Glenview, Illinois: Scott Foresman and Co., 1971), p.

<sup>3</sup>George F. Madaus, Peter W. Airasian, and Thomas Kellaghan, School Effectiveness: A Reassessment of the Evidence (New York: McGraw-Hill Co., 1980), p. 4.

<sup>4</sup>James S. Coleman, Equality of Educational Opportunity (Washington D.C.: U. S. Government Printing Office, 1966), p. 299.

variables that are critically affecting student achievement. The Coleman study reported that the variance in student achievement accounted for by background factors and attitudes was between 30 and 50 percent for all different groups included in the research study. Among the predictor variables that were used in this study were parents' education, parents' educational desires, urbanism of background, teachers' perception of student quality, teachers' perception of school quality, and so on.

Results of similar studies have also revealed that background factors are important in educational attainment. Those studies show that a student's background has a strong influence on that pupil's academic performance. The results are consistent across studies. The background variables as measured by socioeconomic status of a student's family (parents' income, parents' education, parents' occupation) always proved to be a significant predictor of a student's academic achievement.<sup>5</sup>

The empirical analysis of predictors of school effectiveness now points out that student performance is somewhat related to the different characteristics of communities, families, teachers, school resources, and educational programs which are associated with schools. That means that a significant amount of achievement is explained by family background characteristics and by school resource factors. George W. Mayeske in his investigation A Study of the Achievement of Our Nation's Students found ". . . that 48 percent of achievement was associated with family background, 21 percent with school characteristics, and 32 percent with both."<sup>6</sup>

<sup>5</sup>William H. Sewell and Robert M. Hauser, Education, Occupation, and Earnings: Achievement in the Early Career (New York: Academic Press, 1975), p. 185.

<sup>6</sup>George W. Mayeske, A Study of the Achievement of Our Nation's Students (Washington, D.C.: U. S. Government Printing Office, 1973), p. 13.



But the concept of family background is a more complex variable. It is not only a structural characteristic which represents quantitative descriptions of the home resources, but it is also a process factor which reflects complex interactions between resources and persons at home. Mayeske clarifies this distinction in his study:

Of the seven student indices available to us for analysis, we can classify some as being more representative of the structural aspects of the family while others are more representative of its behavioral aspects. For example, the variable called Socio-Economic Status (SES) pertains more to the resources in the home, both physical and human. . . than it does to the activities that parents engage in with their children. According to this line of reasoning, the variable called Study Habits (HBTS) pertains very much to activities that parents engage in with their children, since it contains such items as how often the child discusses his school work with his parents, how often he was read to as a child before he started school, how much time he spends on homework, how many hours a day he watches TV, etc.<sup>7</sup>

There seems to exist an incremented tendency in educators and behavioral researchers to study process variables when assessing the various aspects of school resources as predictors of academic achievement. When appealing to process variables it is possible to detect the really important interaction of school resources and school outcomes.<sup>8</sup> For instance, the mere existence of a remedial program in college does not tell us if the program was used by the students, and, if it was, we do not know if the appropriate students used it or the teachers used proper teaching procedures. Then, from the perspective of process-oriented variables as predictors of academic achievement ". . . it is the teaching and not the

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<sup>7</sup>Ibid., p. 95.

<sup>8</sup>Spady, p. 137.

teacher, the classroom learning environment and not its physical characteristics, that are important for school learning."<sup>9</sup>

A review of current literature in educational research suggests that process variables may be of significant relevance in regard to student academic achievement. In a study by Madaus et al.,<sup>10</sup> measures of school climate, based on perceptions of students and teachers, were found to be related to a large between-class achievement variance. Brookover et al.<sup>11</sup> also found that three kinds of school climate variables, i.e., student sense of academic futility, teacher-students' commitment to improve, principal's evaluations of present school quality, etc., explained 73 percent of the variance on academic achievement of students.

Student perceptions of school effectiveness, as a process variable, are also used as a predictor of student achievement. An indirect support to this statement is provided by recent studies which have pointed out the validity of ". . . evaluations of an organization's performance made by groups and individuals in its environment."<sup>12</sup>

Student perceptions of school effectiveness, as a process variable, appear to be a good source of information about the impact of human and structural sources of school on the educational demands of the academical groups concerned with the school's activities. Support

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<sup>9</sup>Madaus, Airasian, and Kellaghan, p. 104.

<sup>10</sup>George F. Madaus et al., "The Sensitivity of Measures of School Effectiveness," Harvard Educational Review 49 (May 1979): 220.

<sup>11</sup>Wilbur B. Brookover et al., "Elementary School Social Climate and School Achievement," American Educational Research Journal 15 (March 1978): 310.

<sup>12</sup>Burke D. Grandjean and E.S. Vaughn III, "Client Perceptions of School Effectiveness," Sociology of Education 54 (October 1981): 275.

for this statement is supplied by Cohen's study about the reliability of student evaluations of teachers. After examining 41 independent studies, he concluded that, "student ratings of instruction are a valid index of instructional effectiveness. Students do a pretty good job of distinguishing among teachers on the basis of how much they have learned."<sup>13</sup>

Since the relationship of socioeconomic status and student perceptions of school effectiveness with academic achievement has been established to some degree, it would seem reasonable to investigate them in other environments as valid predictors of student achievement. The present research will assess that assumption. That is, since the relationships between socioeconomic status and student perceptions of school effectiveness and academic achievement have been rather well established in studies from other countries, do the same relationships exist for students from the Durango Institute of Technology in Mexico? It is from this setting that this study is undertaken.

#### Statement of the Problem

In order to accomplish the purposes of this study, it was necessary to answer the following questions:

Primary Problem - What relationship do socioeconomic status and student perceptions of school effectiveness have to academic achievement in engineering students?

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<sup>13</sup>Peter A. Cohen, "Student Ratings of Instruction and Student Achievement: A Meta-Analysis of Multisection Validity Studies," Review of Educational Research 51 (September 1981): 305.

- Sub-Problem 1 - What is the relationship between student achievement in engineering and socioeconomic status, i.e. parents' employment, parents' schooling, parents' income, and parents' community?
- Sub-Problem 2 - What is the relationship between student achievement and student perceptions of school effectiveness, i.e. adequacy of curriculum and facilities, quality of instruction, and quality of school services?

#### Basic Assumptions

Some basic assumptions were made in regard to this study.

These assumptions are the following:

1. Student achievement is associated with grades, (i.e., overall grade point average, major grade point average, and mathematics grade point average). That is, grades reflect the differential student learning.
2. All program variables, i.e., student-teacher ratio, program length, difficulty of subject-matter, were essentially equal through the classrooms.
3. Curriculum-based tests were sensitive to student performance.

#### Delimitations of the Study

This study was subjected to the following circumstances:

1. The study was limited to senior students of engineering in the Durango Institute of Technology.
2. The student sample was not randomly selected.

3. Student achievement was measured only in the cognitive domain.
4. The grade point averages were estimated and reported by the students.

#### Definition of Terms

For the purposes of this study, the following definitions were used:

Engineering - The science by which the properties of matter and the sources of energy in nature are made useful to man in structures, machines, and products.

Industrial Engineering - The application of engineering principles and training and the techniques of scientific management to the maintenance of a high level of productivity at optimum cost in industrial enterprises.

Durango Institute of Technology - The public higher education institution in Durango, Mexico, which offers the bachelor's degrees in industrial engineering, civil engineering, food biochemistry engineering, and computer systems, and the master's degrees in industrial planning and food biochemistry.

Teachers - Higher education teachers are those professors who have a bachelor's degree or a more advanced degree.

Socioeconomic Status - The family background of students as estimated by schooling, occupation, income, and community of the parents of the students.

Student Perceptions of School Effectiveness - The students' ratings of school effectiveness on a questionnaire. The

general concepts rated by the students were adequacy of curriculum and facilities, quality of teaching, and quality of school services.

Student Achievement - Behavioral change in students produced by the teaching-learning processes and as measured by curriculum-based tests.

### Hypotheses

The hypotheses which were tested in this study are stated in the operational-null form. They are the following:

Socioeconomic Status and Student Perceptions of School Effectiveness - Hypothesis H<sub>1</sub> was used to test the effect of socioeconomic status and student perceptions of school effectiveness on student achievement.

1. Hypothesis H<sub>1</sub> - There will be no significant relationship between socioeconomic status and student ratings of school effectiveness and student achievement.

Socioeconomic Status - Hypotheses H<sub>2</sub> through H<sub>7</sub> were used to test the effect of socioeconomic status on student achievement.

2. Hypothesis H<sub>2</sub> - There will be no significant relationship between the mother's schooling and student achievement.
3. Hypothesis H<sub>3</sub> - There will be no significant relationship between the father's schooling and student achievement.
4. Hypothesis H<sub>4</sub> - There will be no significant relationship between the mother's occupation and student achievement.

5. Hypothesis H<sub>5</sub> - There will be no significant relationship between the father's occupation and student achievement.
6. Hypothesis H<sub>6</sub> - There will be no significant relationship between the parents' income and student achievement.
7. Hypothesis H<sub>7</sub> - There will be no significant relationship between the family's community and student achievement.

Student Perceptions of School Effectiveness - Hypotheses H<sub>8</sub>, H<sub>9</sub>, and H<sub>10</sub> were used to test the effect of student perceptions of school effectiveness on student achievement.

8. Hypothesis H<sub>8</sub> - There will be no significant relationship between the student ratings of adequacy of curriculum and facilities and student achievement.
9. Hypothesis H<sub>9</sub> - There will be no significant relationship between the student ratings of quality of instruction and student achievement.
10. Hypothesis H<sub>10</sub> - There will be no significant relationship between the student ratings of quality of school services and student achievement.

#### Variables Active in the Study

The independent variables considered in the study were

- Father's schooling
- Mother's schooling
- Father's occupation
- Mother's occupation
- Family income
- Parents' community

- Student ratings of adequacy of curriculum and facilities
- Student ratings of quality of instruction
- Student ratings of quality of school services

The dependent variable of the study was

- Overall grade point average

#### Procedure for the Study

The nature of the study was that of descriptive research. The study explored the relative contribution of socioeconomic status and student perceptions of school effectiveness in academic achievement in engineering students. Also, the study examined the relative contribution of each socioeconomic status variable on student achievement and the relative contribution of each student perceptions of school effectiveness variable on student achievement.

#### Statistical Treatment of the Data

The data obtained from the study were analyzed through simple correlation and stepwise multiple regression. The latter is a technique used to find the correlation between a single dependent variable and a large group of independent variables. The independent variable with the highest coefficient of correlation (simple correlation) is entered first into the stepwise multiple regression equation and explains the largest portion of the variance found in the dependent variable. The remaining variables are entered into the equation in order of their contribution in explaining the remaining variance in the criterion variable. The inferential statistics technique to test significance of relationship was analysis of variance (F test), and the significance level was tested at the five percent (0.05).



## CHAPTER II

### REVIEW OF THE LITERATURE

Current literature in education points out that student background is a critical factor in determining student achievement. Also, school resources, human and material, have been found to be related to academic achievement. In this chapter, a review of the literature related to those factors will be presented. Major emphasis will be given to the studies of student background and of student ratings of school effectiveness.

#### Socioeconomic Status and Student Achievement

The effect of family background on the academic achievement of students has received special attention since James S. Coleman's study called Equality of Educational Opportunity. The relevance of this study is that it went beyond the previous investigations in education by accounting for many variables that could be related to student achievement. The purpose of Coleman's study was to examine the relationship of school and student characteristics with the academic achievement of students. He examined student variables such as parents' education, urbanism of background, parents' interest; school variables such as average number of science and language courses, average hours of homework; and teacher variables such as perceptions of school quality, experience, verbal ability, etc. The main finding of the

Coleman Report<sup>1</sup> was the importance of socioeconomic background of the students in determining their academic achievement. Of the school factors measured in the study, those that had the greatest effect were the teacher's characteristics, specifically, the teacher's verbal skills and his/her family educational background.

Another national study, based on data compiled by the Coleman's study, also examined the variables affecting student achievement. The research conducted by George W. Mayeske focused on which aspects of the student's background, alone or in combination with school characteristics, affected the learning of students. We found that

. . . undertaken for all racial-ethnic groups combined. . .  
48 percent of achievement was associated with Family  
Background, 21 percent with School Characteristics, and  
32 percent with both.<sup>2</sup>

Other investigations have reported similar findings with respect to the relationship of family background and student achievement. A study by Barrick<sup>3</sup> investigated achievement and attitudes toward mathematics of high school students and showed that the socioeconomic status of students was significantly related to achievement in mathematics; and while the students of higher social status continued to enroll in mathematics, the students of lower status did not. Morgan<sup>4</sup> studied

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<sup>1</sup>James S. Coleman, Equality of Educational Opportunity (Washington, D.C.: U. S. Government Printing Office, 1966), p. 21.

<sup>2</sup>George W. Mayeske, A Study of the Achievement of Our Nation's Students (Washington, D.C.: U. S. Government Printing Office, 1973), p. 13.

<sup>3</sup>Stanley W. Barrick, "Achievement in an Attitude toward High School Mathematics with Respect to Sex and Socioeconomic Status," Dissertation Abstracts International 41-5A (November 1980): 1989.

<sup>4</sup>Bruce B. Morgan, "The relationship of Social Class to School Achievement in Kansas City, Missouri, 1950-1970," Dissertation Abstracts International 40-10A (April 1980): 5255.

the relationship of social class, as measured by father's occupation, to school achievement. He concluded that there was a relationship between social class and achievement on standardized tests in sixth-grade students in Kansas City, Missouri.

Fortune<sup>5</sup> investigated the relationship between socioeconomic status and academic achievement in students of different ethnic groups. Although he stated that there were significant differences in achievement for students of different ethnic groups, he remarked that the results of the study clearly showed a pattern: as the socioeconomic status of students increased, academic achievement increased for all ethnic groups.

Studies of the effect of income level on student learning were made by Patricia C. Sexton. Studying family income levels as a predictor of scores on a standardized test in students of fourth, sixth, and eighth grades, she found that ". . . achievement scores tend to go up as income levels go up."<sup>6</sup>

In reference to socioeconomic status, several home background characteristics must be considered before making adequate predictions of student achievement. Dwight Cline<sup>7</sup> studied different home variables

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<sup>5</sup>Ronald F. Fortune, "The effects of Race and Socioeconomic Status on Student Achievement," Dissertation Abstracts International 41-1A (July 1980): 147.

<sup>6</sup>Patricia Cayo Sexton, Education and Income (New York: The Viking Press, Inc., 1961), p. 27.

<sup>7</sup>H. Dwight Cline, "A Study of the Relationship of Selected Factors and Student Achievement in Auto Mechanics," (Unpublished Doctoral Dissertation, University of Kentucky, 1974), p. 85.

which could affect student achievement in auto mechanics in addition to teacher variables; the variables investigated were parents' income, father's educational level, and mother's schooling. The study found no significant relationship between student achievement and father's occupation, parents' level of income, or father's education. However, he did find that the mother's schooling was significantly related to student achievement.

The formal schooling of parents is also studied in other investigations; and although there is some evidence supporting it as a predictor of student achievement, there is some controversy involving gender. Harmon<sup>8</sup> notes that college students with well educated parents, especially the father, were likely to be more proficient on college examinations. In another study, Murnane et al.<sup>9</sup> found that there was a statistically significant relationship between mothers who completed high school and the cognitive achievement of their children. However, they remarked that the crucial factor in determining achievement of children is not so much the presence of absence of schooling in parents as their involvement in the educational process.

In a somewhat related study, Husen<sup>10</sup> found that the educational plans of students regarding schooling are firmly related to parental education.

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<sup>8</sup>David W. Harmon, "A Study of Low Socio-Economic Status, Achievement, Selected Personality and Experiential Factors among College Students," Dissertation Abstracts International 41-4A (October 1980): 1403.

<sup>9</sup>Richard J. Murnane, Rebecca A. Maynard, and James C. Ohls, "Home Resources and Children Achievement," Review of Economics and Statistics 63 (August 1981): 369.

<sup>10</sup>Torsten Husen, Social Background and Educational Career (Paris, France: OECD Publications, 1972), p. 140.

Using a longitudinal technique in urban and suburban public and parochial school systems, Rehberg and Rosenthal studied the relationship between social class as measured by parents' education and parents' occupation and course grades. The results were not consistent with those of previous studies. The authors concluded that

. . . course grades our data reveal, are just not strongly affected by student social class. The total association of class with achievement is modest at best; none of it is causally direct, and of the portion that is causally indirect a good part is indirect by way of educational ambition, itself a merit construct.<sup>11</sup>

Several studies have attempted to relate the community characteristics of parents with academic performance of students. According to Lavin many studies of rural-urban background have found ". . . that students from urban areas have higher levels of academic performance than students from less populated areas."<sup>12</sup>

Shaw and Brown<sup>13</sup> pointed out that size of parents' hometown or community denoted a certain relationship to student achievement. They studied a college sample which, divided into two groups, had the same performance on a test of intelligence but different grade point averages. They found that 47 percent of students in the group with a low grade point average came from small towns while 50 percent of students of the group with high grade point averages came from larger communities.

Additional support for the relationship between community characteristics and student achievement was provided by Washburne. The

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<sup>11</sup>Richard A. Rehberg and Evelyn R. Rosenthal, Class and Merit in the American High School (New York: Longman Inc., 1978), p. 168.

<sup>12</sup>David Lavin, The Prediction of Academic Performance (New York: Russell Sage Foundation, 1965), p. 132.

<sup>13</sup>Merville C. Shaw and Donald J. Brown, "Scholastic Underachievement of Bright College Students," Personnel and Guidance Journal 36 (November 1957): 198.

investigator studied two college samples from two different universities, and found that the correlation between academic performance and level of urbanism was of 0.37 and 0.31 for the two college samples. Therefore the author concluded ". . . that for both samples the more urban the residence background of the student, the better his academic performance is likely to be up to a point . . . ."14

Wilma B. Sanders et al.<sup>15</sup> compared urban, mixed, and rural groups of college students with respect to their scholastic aptitude scores, knowledge of algebra, and academic performance as measured by grades. They found that the group with rural-farm background had significantly lower scores on tests of scholastic aptitude and on standardized tests of achievement than the groups from urban and mixed backgrounds. However, the three groups were not significantly different in respect to measures of scholastic performance based on college grades.

The above examination of the determinants of educational achievement has consistently showed that family background is related to student performance. Conclusions have been reached in most of the studies on school effectiveness in the United States. Similar studies in other countries have also found the same results. In an evaluation of the effect of family background on student achievement in studies from the United States, Sweden, and England, Burnstein et al. concluded that

The relationship of a student's relative background and relative achievement within schools was strong and

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<sup>14</sup>Norman Washburne, "Socioeconomic Status, Urbanism, and Academic Performance in College," Journal of Educational Research 53 (December 1959): 137.

<sup>15</sup>Wilma B. Sanders et al., "Intelligence and Academic Performance of College Students of Urban, Rural, and Mixed Backgrounds," Journal of Educational Research 49 (November 1955): 193.

consistent across countries . . . . the benefits of coming from a higher status home environment than do one's schoolmates typically translate into higher test performance as well. . ."<sup>16</sup>

Data in countries of the third world support the findings regarding the relationship between socioeconomic status and student achievement in developed countries. In a study using a tenth grade sample in Sri Lanka, Niles<sup>17</sup> found that measures of various factors of family socioeconomic status such as father's occupation, father's education, father's income, family income, mother's occupation, and family education showed a substantial relationship to academic achievement as measured by a public standardized test; the correlation between family socioeconomic status and student achievement was 0.61. However, using regression analysis on the socioeconomic variables in order to assess which of those variables influenced academic achievement of students the most, educational and cultural background showed stronger effects on performance than did father's occupation or family income.<sup>18</sup>

In Cameroon, another study<sup>19</sup> reported similar findings. The investigation examined the scores of students who took a secondary school entrance examination. The results of the study showed that children from white-collar and trading backgrounds had better grades than students from

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<sup>16</sup>Leigh Burnstein, Kathleen B. Fisher, and M. David Miller, "The Multilevel Effects of Background on Science Achievement: A Cross-National Comparison," Sociology of Education 53 (October 1980): 224.

<sup>17</sup>F. Sushila Niles, "Social Class and Academic Achievement: A Third World Reinterpretation," Comparative Education Review 25 (October 1981): 423.

<sup>18</sup>Ibid., 424.

<sup>19</sup>Brian Cooksey, "Social Class and Academic Performance: A Cameroon Case Study," Comparative Education Review 25 (October 1981): 406, 410.



farming and manual labor backgrounds. Moreover, the students of well educated parents had the highest passing grades.

In summary, the research seems to indicate that socioeconomic status is strongly related to student achievement. Sewell and Hauser stated:

We have already noted the extent to which socioeconomic background affects educational attainment, occupational status, and learning, even when we control academic ability and intervening achievements . . . every measure of socioeconomic background affects each measure of son's achievement. . . .<sup>20</sup>

Lavin, after reviewing various studies about socioeconomic status and student achievement, also concluded that ". . . SES is directly related to academic performance. That is, the higher one's social status, the higher his level of performance. This relationship holds for all educational levels."<sup>21</sup>

A similar conclusion was reached by Averch et al.<sup>22</sup> When they reviewed the contemporary research regarding socioeconomic status and its relationship to educational outcomes, they pointed out that we could more accurately predict academic achievement of students if we knew their socioeconomic background.

#### Student Ratings of School Effectiveness and Student Achievement

The most important function of school as an institution is teaching, and ". . . the crucial test of teaching is what effect does it

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<sup>20</sup>William H. Sewell and Robert M. Hauser, Education, Occupation, and Earnings: Achievement in the Early Career (New York: Academic Press, 1975), p. 185.

<sup>21</sup>Lavin, p. 125.

<sup>22</sup>Harvey A. Averch et al., How Effective is Schooling? A Critical Review of Research (Santa Monica, Calif.: Rand Corporation, 1974), p. 51.



have upon those who are being taught."<sup>23</sup> It is considered that, although students are not viewed as experts on effective teaching, their evaluations do reveal something about the effects that school in general and a teacher in particular have on students. It is also assumed that the impact of schools and teachers is not uniformly distributed to all students; and, therefore, the differences in perceptions of school and teacher effectiveness may reflect those differential effects. That means that student perceptions of school effectiveness "... are strongly influenced by their own experiences in the school. . ." <sup>24</sup> And those perceptions reflect the experience "... of the students who are directly involved in the learning situation. . . ." <sup>25</sup>

There is a tendency to take into account student evaluations when examining teaching effectiveness. In an extensive survey developed to study the techniques used for the evaluation of college instruction, examining the entire population of higher education institutions in the United States, Asting and Lee<sup>26</sup> found that the frequency of use of informal student opinions, systematic student ratings, and alumni opinions as sources of information in the evaluation of teaching effectiveness was

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<sup>23</sup>Robert B. Hayes, "A Way to Measure Classroom Teaching Effectiveness," Journal of Teacher Education 14 (June 1963): 168.

<sup>24</sup>Burke D. Grandjean and E. Sidney Vaughn III, "Client Perception of School Effectiveness: A Reciprocal Causation Model for Students and their Parents," Sociology of Education 54 (October 1981): 289.

<sup>25</sup>Laura Kent, "Student Evaluation of Teaching," Educational Record 47 (Summer 1966): 379.

<sup>26</sup>Alexander W. Astin and Calvin B. T. Lee, "Current Practices in the Evaluation and Training of College Teachers," Educational Record 47 (Summer 1966): 365.

41.2 percent, 12.4 percent, and 9.9 percent respectively. And in engineering departments the frequency of use of systematic ratings and informal student opinions was 14 and 42.5 percent respectively. Another study<sup>27</sup> reported that the use of formal student evaluations of instructional effectiveness increased from 29.1 percent to 53.1 percent during the period 1973-1978.

However, the critical question regarding student evaluations of instructional effectiveness is whether or not those student perceptions are related to student achievement, the criterion of effectiveness. Several studies succeeded in finding an appreciable relationship between student perceptions of instructional effectiveness and academic achievement.

White et al.<sup>28</sup> conducted a study of 338 students in undergraduate education courses. The instructors were full-time professors of educational psychology. The authors used a stepwise multiple regression analysis where the scores of three achievement examinations were utilized as the criterion variable, and the ratings on a questionnaire of instructional improvement were taken as the predictor variables. They found that almost all factors of the predictor instrument were related significantly to student performance, supporting their conclusion that achievement test scores in educational psychology are predicted by student perceptions of teaching effectiveness.

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<sup>27</sup>Peter Selding, "How Colleges Evaluate Teaching," Educational Horizons 58 (1979-1980): 115.

<sup>28</sup>William F. White et al., "Prediction of Student Ratings of College Instructors from Multiple Achievement Test Variables," Educational Psychological Measurement 38 (Winter 1978): 1082.

Using 2300 freshman college students, Sullivan and Skanes<sup>29</sup> studied the relationship between student ratings of instructors and student learning. During the tenth week of the course, the students evaluated items such as instructor interest in students, instructor ability to present material in a clear manner, and so on. And at the end of the 13-week semester the students took a final test and received grades for the course. The authors found a significantly low positive correlation between the means of the instructor ratings and the mean of the final examination grades. Later they reanalyzed the data and divided the instructors into two groups, inexperienced and experienced. Then the authors found that the correlation between student evaluations of teaching and achievement was significant at the 0.01 level with ( $r = .685$ ) for the experienced instructors, but not for the inexperienced instructors (with  $r = .132$ ). These results bear implications for closely examining specific characteristics of the instructors.

Leventhal et al. compared the effects of lecturer's experience on student evaluations of teaching and academic achievement. They manipulated two conditions of teacher's experience (experienced vs. inexperienced) and two conditions of lecture quality (good vs. poor) by telling 237 students from an introductory psychology course that certain professors were experienced and others not and that certain teachers were good lecturers and others were not. The students, after rating their instructors on a 26-item questionnaire, took a quiz on the content of the lecture. The authors found that

. . . in the inexperienced-teacher condition, the good lecturer earned significantly higher ratings

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<sup>29</sup>Arthur M. Sullivan and Graham B. Skanes, "Validity of Student Evaluation of Teaching and the Characteristics of Successful Instructors," Journal of Educational Psychology 66 (August 1974): 586.

and produced significantly higher achievement than the poor lecturer. . . . Thus, because high ratings were associated with high achievement and low ratings with low achievement, ratings predicted student achievement in the inexperienced-teacher condition. . . .<sup>30</sup>

With respect to lecturer quality, the same authors concluded that although lecturer quality showed a relationship with ratings and learning, it affected ratings much more than learning.

In a significant work by Centra,<sup>31</sup> the hypothesis that student ratings of course quality would be related to learning was tested. The study examined the relationship of student ratings of instruction with examination performance. Included in his analysis were two courses in which students had been randomly assigned and prior achievement in the subject matter had been adjusted; he also used two different instruments--one of which asked for general ratings of course and teacher and the other one asked for ratings of more specific teaching practices; the author calculated correlation coefficients between the mean scores of student ratings and the mean examination scores. Centra found high correlation indexes of ratings of the value of the course, of teacher effectiveness, and lecture quality with student achievement. He concluded that, in general, test scores were significantly correlated to several of the specific teaching practice variables and highly correlated to global ratings of the course.

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<sup>30</sup>Les Leventhal et al., "Effects of Lecturer Quality and Student Perception of Lecturer's Experience on Teacher Ratings and Student Achievement," *Journal of Educational Psychology* 69 (August 1977): 369.

<sup>31</sup>John A. Centra, "Student Ratings of Instruction and their Relationship to Student Learning," *American Educational Research Journal* 8 (May 1971): 442.

In a set of five experiments, McKeachie et al.<sup>32</sup> studied the relationship of student ratings to teacher effectiveness as measured by student performance. They studied different samples of college students, different factors of teaching effectiveness, and different criteria of student achievement. The results, analyzed separately for males and females, were complex but the general trend showed significant relations between the ratings of instructor skill and academic achievement for women but not for males.

Gessner<sup>33</sup> examined the hypothesis which states that there is a positive correlation between teaching effectiveness as measured by student ratings and teaching effectiveness as measured by class performance examinations; the sample studied consisted of sophomore medical students. The instructional factors rated were content and organization and presentation; the criterion variables were scores on a national test and on a departmental examination. Gessner found that the correlations between student ratings of instructional effectiveness and class performance on the two tests were 0.77 and 0.69, respectively. He confirmed his hypothesis that the higher the student ratings of instruction the higher the scores of student achievement.

Frey investigated the same problem that Gessner had studied. The sample consisted of calculus students in two courses; they rated their teachers on six different factors of instructional effectiveness: student accomplishment, workload, organization-planning, grading, teacher presentation of course, and teacher accessibility. He found that the

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<sup>32</sup>W. J. McKeachie et al. "Student Ratings of Teacher Effectiveness," American Educational Research Journal 8 (May 1971): 442.

<sup>33</sup>Peter K. Gessner, "Evaluation of Instruction," Science, 180, May 1973, p. 567.

correlation coefficients of the rated factors with student learning were highly positive in all cases; in addition, he found that there was no correlation between test grades and ratings of the instructor.

Frey concluded:

There is no evidence for a strong positive relationship between final exam grades and the ratings when the effects of the different instructors are removed. I believe that the very strong relationship in my study resulted from a successful effort to categorize student ratings in terms of specific factors and thus able to separate more useful from less useful ratings. . . .<sup>34</sup>

Malpass, in an exploratory research effort, studied the effects of students' perceptions of school factors on student achievement as measured by final semester grades. In this study, although the author prevents us from concluding a cause-effect relationship between perceptions of school factors and student achievement, she concluded that ". . . student perceptions of school, and various aspects of school, seem to be related to achievement in school as measured by end-of-semester grades."<sup>35</sup>

The above reviewed studies indicate that there is some evidence to support the assumption that student evaluation of instruction, courses, and teaching is positively related to student learning. However, it is necessary to study the reliability and validity of student evaluations of school effectiveness in order to determine if college students can reliably assess and report on school/classroom learning experiences.

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<sup>34</sup>Peter W. Frey, "Student Ratings of Teaching: Validity of Several Rating Factors," Science, 1982, October 1973, p. 85.

<sup>35</sup>Leslie F. Malpass, "Some Relationship between Students' Perception of School and their Achievement," Journal of Educational Psychology 44 (August 1953): 481.



Support for the reliability of student evaluations of teaching effectiveness was provided by Frank Costin<sup>36</sup> in his study examining student ratings of several teachers from different disciplines according to the stability of their ratings. He obtained indexes of correlation that ranged from 0.70 to 0.87 and concluded that students can rate classroom instruction with a reasonable degree of reliability. Using the test-retest method, Lovell and Haner computed reliability coefficients of student ratings between the scores of two forced-choice test sections separated by an interval of two weeks, and they obtained a correlation of 0.89 for the two tests with 105 college students.

In another study Harvey and Barker<sup>38</sup> administered a 21-item questionnaire to male students. The items rated by the college students were objectives clarified by the instructor, organization of course, knowledge of subject, preparation for class, skill as lecturer, variety in classroom techniques, skill in guiding the learning process, willingness to help, general estimate of teacher, general estimate of the course, and so on. They found a correlation coefficient of 0.9 between the item general estimate of the teacher and the other items of the questionnaire. This value demonstrated a high internal consistency among the items of this questionnaire used to evaluate student perceptions of instructional effectiveness.

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<sup>36</sup>Frank Costin, "A Graduate Course in the Teaching of Psychology: Description and Evaluation," Journal of Teacher Education 19 (Winter 1968): 430.

<sup>37</sup>George Lovell and Charles F. Haner, "Forced-Choice Applied to College Faculty Rating," Educational and Psychological Measurement 15 (Autumn 1955): 297.

<sup>38</sup>J. Noland Harvey and Donald G. Barker, "Student Evaluation of Teaching Effectiveness," Improving College and University Teaching 18 (Autumn 1970): 278.

Similar results were reported by Spencer and Aleamoni<sup>39</sup> with respect to the internal consistency of a standardized questionnaire applied to a large university sample. The items, rated on a 4-point scale of agreement or disagreement, were organized in six subscales and were general course attitude, method of instruction, course content, interest and attention, instructor and others. The coefficient of internal consistency obtained by the authors was 0.93. In another study, Marsh and Overall<sup>40</sup> examined student ratings of instructional effectiveness from the same students at the end of each course and again one year after graduation. They calculated the reliability in internal consistency of class-average, and the correlation coefficients were 0.76 and 0.80, respectively. Also, the authors obtained the stability coefficient of single raters and it was 0.59.

According to these studies, it would appear that students are capable of rating classroom teaching with some acceptable degree of reliability. Moreover, there is some evidence that students are also capable of recognizing qualities of instruction which improve their academic performance.

Musella and Rush<sup>41</sup> developed a study for the purpose of identifying those characteristics of instructors which would be considered the most

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<sup>39</sup>Richard E. Spencer and Lawrence M. Aleamoni, "A Student Course Evaluation Questionnaire," Journal of Educational Measurement 7 (Fall 1970): 210.

<sup>40</sup>Herbert W. Marsh and J. U. Overall, "Long-Term Stability of Students' Evaluations," Research in Higher Education 10 (April 1979): 142.

<sup>41</sup>Donald Musella and Reuben Rush, "Student Opinion and College Teaching," Improving College and University Teaching 16 (Spring 1968): 140.



important in promoting thinking, and in ranking the qualities of importance in teaching, as estimated by college students. The survey, applied to all senior students of a university, revealed that knowledge of subject was considered the teacher characteristic more important in promoting thinking, and that teacher expertise, systematic organization of subject matter, ability to explain clearly, enthusiastic attitude toward subject, and ability to encourage thought were the five most important qualities for teaching cited by students.

William and Ware investigated the validity of student ratings of instruction for different professors whose lectures varied in content covered and expressiveness of teaching. College students rated their teachers on certain teaching factors and then took an achievement test. The data revealed that higher achievement was associated significantly with content coverage and that expressiveness did not affect achievement. The authors concluded that, "student ratings generally reflected differences in content coverage under low expressiveness conditions ( $p < .05$ ) but were not sensitive to variations in content coverage when lecturers were high in expressiveness."<sup>42</sup>

Attempting to assess the validity and the usefulness of student evaluations of instruction, Marsh et al.<sup>43</sup> calculated validity coefficients using the multi-section procedure. Students in an introductory programming course rated their teachers on a 7-factor questionnaire and were then presented a knowledge examination; at the same time, half of the teachers

<sup>42</sup>Reed G. Williams and John E. Ware Jr., "Validity of Student Ratings of Instruction under Different Incentive Conditions: A Further Study of the Dr. Fox Effect," Journal of Educational Psychology 68 (February 1976): 48.

<sup>43</sup>Herbert W. Marsh et al., "Validity and Usefulness of Student Evaluation of Instruction Quality," Journal of Educational Psychology 67 (December 1975): 836.

received feedback from the student evaluations. They found a correlation coefficient of 0.43 between class presentation and student achievement, a correlation coefficient of 0.44 between overall instructor teaching course and student performance, and a correlation coefficient of 0.42 between overall instructor evaluations and student achievement. These positive indexes of correlation supported the validity of student evaluations of instructional quality. Furthermore, the teachers in the feedback condition were rated better by students in a second application of the evaluation instrument although examination scores of students did not improve on the final examination.

In Lackey's study,<sup>44</sup> the structure of students' evaluations of teaching in biology, mathematics, and sociology was compared. Using a multiple regression analysis, the author analyzed eight factors to explain the student ratings of instruction. He found that in biology the eight factors explained 46 percent of the variance in student ratings; in mathematics the same eight factors explained 58 percent of the variance in student evaluations; and in sociology the eight factors explained 72 percent of the variance in student ratings of instruction. However, each factor contributed different weights in explaining student ratings. Professor's preparation explained 30 percent of the variance in student ratings in biology, fairness in grading explained 35 percent of the variance of student evaluations in mathematics, and teacher's communication explained 59 percent of the variance of ratings in sociology. It is relevant to notice that knowledge of subject did not contribute

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<sup>44</sup>p. N. Lackey, "Comparison of the Structure of Students' Evaluations of Teaching in Biology, Mathematics, and Sociology," College Student Journal 14 (Spring 1980): 28.

significantly enough to explain the variance in the student evaluations of teaching in any of the three subjects studied. Further support to the validity of student perceptions of instructional effectiveness was supplied by Marsh's study<sup>45</sup> which showed that college students were able to distinguish between those teachers who contributed most to their educational experience and those who did not.

It would appear, having reviewed the above studies, that student ratings of teaching effectiveness discriminate validly the variables of instruction which increase students' learning. However, a series of studies examined the possibility of contamination of that validity by the grades that students obtained in the courses they rated. Brown's study<sup>46</sup> related grades professors gave to their students to ratings those students gave their teachers. Using a multiple regression analysis the author found that average grade significantly improved the multiple correlation between students' evaluations and 12 predictors of ratings. Grades were the best predictor of student evaluations. Also, Worthington and Wong<sup>47</sup> considered that the validity of student evaluations of instructional effectiveness must be questioned seriously because they found that college students rated their instructors higher when they were assigned higher grades.

However, using sophisticated methods in evaluating the effects of grades on student ratings, other studies concluded that college

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<sup>45</sup>Herbert W. Marsh, "The Validity of Students' Evaluations," American Educational Research Journal 14 (Fall 1977): 446.

<sup>46</sup>David L. Brown, "Faculty Rating and Student Grades: A University-Wide Multiple Regression Analysis," Journal of Educational Psychology 68 (October 1976): 576.

<sup>47</sup>Alan G. Worthington and Paul T. P. Wong, "Effects of Earned and Assigned Grades on Student Evaluations of an Instructor," Journal of Educational Psychology 71 (December 1979): 771.

student evaluations of instruction are not significantly affected by the marks on academic examinations. Voeks and French in their study of college students concluded that ". . . high ratings cannot be 'bought' by giving high grades, nor are they lost by giving low grades."<sup>48</sup>

In the same sense, Rayder<sup>49</sup> found that student ratings of instructors were not significantly related to grade point average. Another study was developed in order to determine experimentally whether or not knowledge of final grade would affect how students evaluate the courses and the instructors. In this study college students were divided into two groups; in one group students received their grades before they answered a teacher evaluation questionnaire; in the other group, students received their grades after they filled out the evaluation form on instruction. The analysis of the ratings did not show significant differences between the two groups. Therefore, the author concluded that, "the overall results . . . indicate that knowledge of final grade does little if anything to influence end of course ratings by students."<sup>50</sup>

It would appear, then, that college students objectively evaluate their courses without permitting grades received to contaminate or bias their course or teacher ratings.

The review of these studies shows that student ratings of instructional effectiveness provide reliable and valid information about

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<sup>48</sup>Virginia W. Voekers and Grace M. French, "Are Student-Ratings of Teachers Affected by Grades?," Journal of Higher Education 31 (June 1960): 333.

<sup>49</sup>Nicholas F. Rayder, "College Student Ratings of Instructors," Journal of Experimental Education 37 (Winzer 1968): 78.

<sup>50</sup>Pietro J. Pascale, "Knowledge of Final Grade and Effect on Student Evaluation of Instruction," Educational Research Quarterly 4 (Summer 1979): 55.

classroom instruction. Moreover, it seems that student evaluations are more related to the quality of instruction received than to the grades assigned or student perception of the verbal ability of the teacher.

#### Summary

The studies reviewed above provide factual support in considering socioeconomic status and student perceptions of school effectiveness as valid explanatory variables of student achievement, and thus provide an adequate background for this study.

### CHAPTER III

#### DESIGN AND METHODOLOGY

Described in this chapter is the procedure used in conducting the study. The research was descriptive in nature and was designed to determine the relative contribution of socioeconomic status and student perceptions of school effectiveness to academic achievement of engineering students. Also, the writer tried to determine the relative contribution of each variable forming the two mentioned sets of variables to academic achievement of senior engineering students from the Durango Institute of Technology.

#### Population

Subjects for the study consisted of 116 undergraduate senior students at Durango Institute of Technology, Durango, Mexico. However, the final sample consisted of 110 subjects; the other six subjects were eliminated from the analysis of data because of missing data. The majority of students were between the ages of 21 and 23, with a mean age of 22.4 years. There were a few younger and older subjects, and the range at the time of answering the questionnaire was from 20 to 28 years of age. The questionnaire was administered between April 26 and April 29 of the January-June semester of 1983.

Although most of the students were to be graduated in June of 1983, nine biochemical engineering students who were to graduate in December of 1983 were included in the study. Ninety one of the students



were males and nineteen were females. All of the subjects were enrolled in the last major courses from the different areas of the curriculum offered by the institute. The participants included 54 students to be graduated in industrial engineering in five specialities, 41 students in civil engineering in 3 specialities, 12 students in biochemical engineering, and 3 students in information systems. They agreed to complete the survey questionnaire on a voluntary basis.

#### Instrumentation

The basic instrument used in collecting the data was composed in two different sections and asked for

- Information about the socioeconomic status of students and academic achievement of students, and
- Student perceptions of school effectiveness.

#### Socioeconomic Status Data

The data (variables) collected about the socioeconomic status of students were

- occupation of the student's father
- occupation of the student's mother
- father's educational level
- mother's educational level
- father's monthly salary
- mother's monthly salary
- family's community population

#### Academic Achievement Data

The data collected about the academic achievement of students were

- mathematics grade point average
- major grade point average
- overall grade point average

The grade point averages were based upon a ten point system, and they represent the percentage of educational objectives that a student accredited in the courses of his professional career.

The overall grade point average, the criterion variable used in the data analysis, was calculated from subject matters with a value of 380 credits; the major grade point average was calculated from subject matters with a value of 234 credits, and the mathematics grade point average was calculated from subject matters with a value of 32 credits.

#### Student Perception of School Effectiveness

The data (variables) collected regarding student perceptions of school effectiveness were

- student ratings of adequacy of curriculum and facilities
- student ratings of quality of teaching
- student ratings of quality of college services

The information about student ratings of adequacy of curriculum and facilities was gathered from questions which asked for (1) appropriateness of training including professional training, mathematics teaching, laboratory instruction and field training, and (2) adequacy of equipment and facilities.

In respect to student ratings of quality of teaching the information was obtained from questions which asked for (1) quality of teacher's instruction, (2) teaching techniques in the classroom, (3) instructor's attitudes toward students and (4) teacher's knowledge of subject matter.



A question asking for quality of nine services provided by the institute furnished information concerning student ratings of quality of school services, i.e. library, recreational programs, athletic programs, health service, etc. In total, the section provided information on twenty five items.

In this section of the questionnaire the students assigned their ratings to each of the twenty five items according to a continuous numeric scale with values from 1 to 6 and the quality scale corresponding to each numeric value was bad, poor, fair, good, very good, and excellent. See appendix A for a copy of the questionnaire.

#### Procedure

##### Administration of the Questionnaire

The questionnaire was translated into Spanish and sent to the Durango Institute of Technology in Mexico (see Appendix B for a Spanish version of the questionnaire). There, a psychologist from the Department of Educational Technology assisted the author in administering the questionnaires. Students were asked to answer the instrument according to their major. The dates of application of the instrument were from April 26 to April 29 of 1983. The sessions were scheduled Tuesday through Friday in the morning in an audio-visual room of the institute. Simple instructions for answering the questionnaire were included on the instrument. However, the same instructions were given verbally by the examiner.

##### Scoring

Scoring for the two parts of the questionnaire was executed in such a manner that higher scores represented higher ratings. For example,

in item number two of the first section, a mother with 1-3 years of schooling was assigned a score of 1, and the mother with 16-18 years of schooling was assigned the score of 6. Therefore, for all the items used in this study, the criteria used was as ratings rose, so did scores. See Table 1 for the possible range of scores assigned to each variable of the first section of the instrument.

TABLE 1  
RANGE OF SCORES ASSIGNED TO THE VARIABLES  
OF SES AND STUDENT ACHIEVEMENT

Variable	Range of Scores
Father's occupation	1 - 100
Father's schooling	1 - 6
Mother's schooling	1 - 6
Family income	1 - 11
Parent's community population	1 - 5
Overall grade point average	1 - 5

#### Analysis of Data

The questionnaires were examined and the data were coded according to the steps mentioned above. The data were then keypunched on computer cards which were processed at Western Kentucky University Computing Center.

The first step taken in the analysis of data was to determine correlation coefficients for each of the five variables reflecting socioeconomic status (mother's occupation was eliminated from the analysis because of insufficient data). The same analysis was done with the

twenty five variables reflecting student perceptions of school effectiveness (each item of the second section of the instrument was considered as a variable). This analysis permitted judgments about the existence of the problem of multicollinearity.

Because the nature of the questions asked required the use of multiple regression analysis, the existence of a high intercorrelation among the independent variables would not permit the use of regression analysis using the a priori defined set of independent variables. Therefore, the second step in analyzing the data was to use the technique called truncated component regression (TCR). The essential steps in a TCR are (a) definition of the principal components of the independent variables, (b) selection of the major components, (c) computation of component scores for these selected components, and (d) use of the component scores instead of the original variables as independent variables. This analysis permitted the empirical definition of a set of socioeconomic and school factors which were orthogonal with respect to each other.

The third step in analyzing the data was to determine the relative contribution of socioeconomic status and school components to student achievement by entering the two sets of variables into a multiple regression equation.

This analysis permitted the elaboration of a multiple regression analysis table to show the relative contribution of the two sets of independent variables (socioeconomic status and student perceptions of school effectiveness). The outcome of this analysis was used as the basis for accepting or rejecting the null hypothesis concerning the combined set of socioeconomic and school factors. The minimum level of

significance considered when accepting or rejecting the hypothesis was the five percent (.05) level.

The next step was to remove the socioeconomic factor, then school factors, from the general multiple regression equation. The consideration is that this process can give some insight into the possible effects of each set of variables on student achievement, and consequently, strengthen the results reached in the third step of the analysis of data.

The fifth step taken in the analysis was to determine the relative contribution of the socioeconomic variable to the variance in student achievement. Again, a multiple regression equation was used. The results of this analysis were used as the basis for accepting or rejecting the null hypothesis concerning to socioeconomic status at the significance level of five percent (.05).

The last step was similar to step five. But the variables entered into the regression equation were the variables forming the set of student perceptions of school effectiveness (school factors). The results of this analysis permitted acceptance or rejection of the null hypotheses concerning each factor of the school variables at the five percent (.05) level of significance.

## CHAPTER IV

### RESULTS

This chapter includes the statistical analysis of the data gathered for this study. The analysis will be presented in three parts, and each part will then be divided into several sub-sections, each one dealing with a different set of variables.

Because of the nature of the data analyzed it was necessary to execute factor analysis. This analysis changed the nature and number of the independent variables of this study, and consequently, the correspondent null hypotheses enunciated in chapter I. Therefore, the new null hypotheses needed will be mentioned in the section of multiple regression analysis of this chapter.

#### Simple Correlation Among Socioeconomic Status and Student Perceptions of School Effectiveness Variables

##### Socioeconomic Status Variables

The intercorrelation coefficients among the five independent variables representing socioeconomic status (father's occupation FOCC, father's schooling FSCHL, mother's schooling MSCHL, Family income and family's community population COMM) are shown in Table 2.

TABLE 2  
INTERCORRELATION MATRIX OF SOCIOECONOMIC VARIABLES

Variable	FOCC	FSCHL	MSCHL	INCOME	COMM
FOCC	1.000				
FSCHL	0.659*	1.000			
MSCHL	0.567*	0.620*	1.000		
INCOME	0.675*	0.455*	0.471*	1.000	
COMM	0.409*	0.368*	0.382*	0.234**	1.000

\*Significant at the .0001 level

\*\*Significant at the .0122 level

An examination of Table 2 shows that the socioeconomic variables are highly intercorrelated, suggesting a high degree of multicollinearity among the socioeconomic status variables. However, when a set of variables is to be used as independent variables in a multiple regression analysis but the set of variables is multicollinear, the multiple regression analysis cannot be executed as attempted.<sup>1</sup> Therefore, it is recommended that some technique be used to supplement the multiple regression analysis. In this study the technique used to remedy the problem of multicollinearity is called truncated component regression (TCR). According to Bernstein

The TCR approach has the advantage of translating a large number of multicollinear variables into a smaller, orthogonal set. Components are used instead of common factors so that the predictors simply become translations of observables instead of estimates of theoretically "pure" variates which . . . are confounded by the problem of item overlap. . . .<sup>2</sup>

<sup>1</sup>Ira H. Bernstein et al., "Truncated Component Regression. Multicollinearity and the MMPI's use in a Police Officer Selection Setting," Multivariate Behavioral Research 17 (January 1982) p. 100.

<sup>2</sup>Ibid., p. 102.



### Student Perceptions of School Effectiveness Variables

The simple correlation coefficients among the twenty-five variables representing student perceptions of school effectiveness were similar to those of the socioeconomic variables, and their significance level ranged from 0.044 to .0001. As in the case presented above, the problem of multicollinearity suggested the use of the truncated component regression technique (TCR).

### Factor Analysis of Socioeconomic Status and Student Perceptions of School Effectiveness

The first step in a truncated component regression analysis is to do a factor analysis of the multicollinear variables by using the method of principal components. This method reduces the large set of multicollinear variables into a smaller set called principal components which are selected according to the criterion of an eigenvalue greater than 1.0 or equal to 1.0. Then, the principal components are rotated (by the varimax method) producing an orthogonal set of variables. From this orthogonal set of factors are derived the factor scores which are used instead of the original variables as independent variables.

### Factor Analysis of Socioeconomic Status

A principal component analysis of the five socioeconomic variables produced only one component with an eigenvalue greater than or equal to 1.0. This component accounted for 59.5 percent of the total variance. Because this analysis produced only one component, rotation did not seem to make sense, and therefore, that step was skipped. The component produced, which will be the base to calculate the factor score coefficients, is described in Table 3. The interpretation of this is

straightforward and seems to represent a general socioeconomic factor defined by the five socioeconomic variables: father's occupation (FOCC), father's schooling (FSCHL), mother's schooling (MSCHL), income (INCOME), and family's community population (COMM).

TABLE 3  
COMPONENT STRUCTURE OF THE SOCIOECONOMIC STATUS VARIABLES

Component	
Variable	I
FOCC	0.878
FSCHL	0.823
MSCHL	0.799
INCOME	0.748
COMM	0.578

#### Factor Analysis of Student Perceptions of School Effectiveness

A principal component analysis produced six components with eigenvalues greater than or equal to 1.0. These components accounted for 37.5, 10.1, 5.3, 5.0, 4.5, and 4.2 percent of the total variance, respectively. The six components accounted for 66.6 percent of the total variance and were rotated following the varimax method. The component structure produced, and which will be the base to calculate the factor score coefficients, is presented in Table 4. The variables represented in the six components are professional training (PROFTRAI), preparation in mathematics (PREPMATH), laboratory instruction (LABINST), field practices (FIELDPRA), teaching quality (TEACHQUA), lecture (LECTURE), class discussions (CLASSDIS), audiovisual materials (AUDIOVM), learning by doing (LEARBYDO), small group activities (SMALGACT), independent



TABLE 4  
VARIMAX-ROTATED COMPONENT STRUCTURE OF STUDENT  
PERCEPTIONS OF SCHOOL EFFECTIVENESS

Variable	Components					
	I	II	III	IV	V	VI
PROFTRAI	0.116	0.721	0.322	0.021	0.028	0.217
PREPMATH	-0.072	0.628	0.259	0.294	0.149	0.035
LABINST	0.021	0.303	0.754	-0.052	0.145	-0.024
FIELDPRA	0.066	0.352	0.574	0.166	-0.036	0.265
EQUIFACI	0.265	0.077	0.718	0.101	0.135	0.093
TEACHQUA	0.190	0.674	0.339	0.107	0.121	0.264
LECTURE	0.127	0.289	0.144	0.024	-0.025	0.838
CLASSDIS	0.398	0.462	0.030	-0.033	0.405	0.198
AUDIOVM	0.261	0.031	0.119	0.173	0.531	0.527
LEARBYDO	0.275	0.299	0.618	-0.023	0.343	0.033
SMALGACT	0.157	0.482	0.141	0.232	0.550	-0.004
INDSTUDY	0.153	0.203	0.268	0.138	0.760	-0.026
INTESTUL	0.520	0.624	0.152	-0.010	0.290	0.010
ENCOUSTU	0.338	0.636	0.137	0.150	0.402	-0.029
AVAILEXH	0.592	0.568	0.036	0.049	0.032	0.073
TKNOWL	0.602	0.425	0.352	-0.009	-0.025	0.239
JOBPLA	0.706	0.125	0.115	0.256	0.011	0.096
COUNSPPR	0.784	0.095	0.081	0.179	0.099	0.104
HCAREERD	0.672	0.132	0.209	0.268	0.252	0.095
TUTORING	0.716	0.093	0.077	0.176	0.306	0.059
LEARNLAB	0.514	0.035	0.131	0.367	0.159	-0.031
ATHLECSE	0.221	0.147	-0.060	0.783	0.243	0.100
RECREAPR	0.332	0.115	-0.208	0.673	0.210	0.099
LIBRARY	0.166	0.017	0.290	0.698	-0.022	0.017
HEALTSE	0.479	0.268	0.109	0.512	-0.189	-0.246

study (INDSTUDY), interest in student learning (INTESTUL), encouragement to students about professional future (ENCOUSTU), availability for extra-help (AVAILEXH), teacher knowledge (TKNOWL), facilities and equipment (EAUIFACI), job placement (JOBPLA), counseling in personal problems (COUNSPPR), help in making career decisions (HCAREERD), tutoring services (TUTORING), learning lab and packages (LEARNLAB), athletic programs (ATHLECPR), recreational programs (RECREAPR), library (LIBRARY), and health services (HEALTSEER).

Component I appears to represent a help seeking factor. Four student perceptions of school effectiveness variables (JOBPLA, COUNSPPR, HCAREERD, AND TUTORING) load at least 0.67 along with AVAILEXH.

Component II seems to represent a professional factor defined by PROFTRAI and PREPMATH and supported by TEACHQUA and INTESTUL. Component III appears to represent an experience factor and is defined by LABINST, FIELDPRA, EQUIFACI, and LEARBYDO.

Component IV seems to represent an outside classroom activity factor involving physical and cognitive behavior.

Three variables (ATHLECPR, RECREAPR, and LIBRARY) load at least 0.67 and are supported by HEALTSEER. Component V appears to represent a personal encouragement or interpersonal exchange factor and is defined by INDSTUDY and is strongly supported by CLASSDIS, SMALGACT, and ENCOUSTU. Finally,

Component VI seems to represent a delivery factor (LECTURE) supported by AUDIOVM.

The factor analysis of socioeconomic status and student perceptions of school effectiveness yielded one and six components, respectively.

This information is summarized in Table 5. The next step was to calculate the factor score coefficients from the components yielded by factor analysis (varimax rotation). Then, these factor scores representing

TABLE 5  
FACTORS DERIVED FROM SOCIOECONOMIC STATUS AND  
STUDENT PERCEPTIONS OF SCHOOL EFFECTIVENESS

Components		
Variable		Description
Socioeconomic Status	SESFAC1	General Socioeconomic Status Factor
Student Perceptions of School Effectiveness	SCHFAC1	Help Seeking Factor
	SCHFAC2	Professional Preparation
	SCHFAC3	Experience Factor
	SCHFAC4	Outside Classroom Activities
	SCHFAC5	Personal Encouragement
	SCHFAC6	Delivery Factor

orthogonal sets were used as independent variables in a regression equation instead of the a priori variables. Table 6 shows that a very low inter-correlation exists among the factors representing socioeconomic status and student perceptions of school effectiveness: the problem of multicollinearity was eliminated. The last step of the analysis was to use the set of independent factors in a multiple regression equation in order to test our hypotheses.

TABLE 6  
INTERCORRELATION MATRIX OF ALL FACTORS\*

Factor	SESFAC1	SCHFAC1	SCHFAC2	SCHFAC3	SCHFAC4	SCHFAC5	SCHFAC6
SESFAC1	1.000						
SCHFAC1	.014	1.000					
SCHFAC2	.110	.001	1.000				
SCHFAC3	-.014	-.002	.001	1.000			
SCHFAC4	-.044	-.001	.003	.002	1.000		
SCHFAC5	.013	-.002	-.006	-.001	.007	1.000	
SCHFAC6	.011	-.000	-.001	.000	-.001	-.004	1.000

\*All correlation coefficients significant at .323 or greater level

Multiple Regression Analysis of  
Socioeconomic and School Factors

A series of multiple regression analyses were carried out in order to study the relative contribution of socioeconomic and school factors (independent variables) to academic achievement of senior engineering students. The first step was to examine the association of the different sets of independent variables and the dependent variable overall grade point average (OGPA). The results of these multiple regression analyses are summarized in Table 7.

TABLE 7  
SUMMARY OF THE MULTIPLE REGRESSION ANALYSES

Variance in OGPA Attributed to	Multiple <u>R</u>	$R^2$	$R^2$ Change	Significance
With Seven Variables	.428	.183		.005
SESFAC1 Removed			.006	.420
SCHFACs Removed			.173	.004
With SESFAC1	.099	.010		.314
With SCHFACs				
SCHFAC2	.325	.106		.000
SCHFACs 2 and 5	.403	.162	.057	.009

The multiple R describing the association between the set of seven variables investigated by this study and overall grade point average was .428 and was significant at  $p < .005$ . The null hypothesis concerning this association stated that there is no significant relationship between socioeconomic status and school factors and student achievement. On the basis of the results presented in Table 7 and mentioned above, this null hypothesis is rejected. However, as indicated by the multiple R-square of .183, the combination of socioeconomic and school factors explained only slightly over 18 percent of the total variance in student achievement.

Also in Table 7 the relative contribution of socioeconomic status and school factors were examined by removing them from the multiple regression equation in two successive steps. First, the socioeconomic factor (SESFAC1) was removed from the multiple regression equation and the

percentage of variance removed was .6. Second, the six school factors were removed and the percentage of variance removed was over 17 percent. These results suggest that much of the variance in student achievement can be explained by school factors but not by socioeconomic status.

In a second step of the analysis the association of socioeconomic factor and the dependent variable (overall grade point average) was examined. The result of this analysis is shown in the second portion of Table 7. The multiple  $R$  describing the association between the socioeconomic factor (SESFAC1) and overall grade point average was .099 and was not significant at  $p. < .05$ . The null hypothesis concerning this association stated that there is no significant relationship between socioeconomic status and student achievement. Therefore, on the basis of the results presented in Table 7 and mentioned above, this null hypothesis is not rejected. This was also supported by the data presented in the last part of the first step.

In a third step of the analysis the relative contribution of school factors to variance in student achievement was examined. It was clear that the combination of school factors identified in this research contributed significantly to the explanation of variance in student achievement (as it was found in part two of the first step of the analysis). Now, in this third step the individual contribution of each of the six school factors to the variance in student achievement was studied. The factors were entered in the order of their partial correlation with student achievement after partialling out previously entered variables. A summary of the school factors contributing to variance in achievement with a significance less than .05 is shown in the last section of Table 7. In this study, SCHFAC2 clearly contributed more than any of the school factors.



The multiple  $R$  describing the association between SCHLAC2 and overall grade point average was .325 and was significant at  $p < .0007$ . The null hypothesis concerning this association stated that there is no significant relationship between SCHLAC2 and student achievement. On the basis of the results presented in Table 7 and mentioned above, this null hypothesis is rejected. In addition, SCHLAC5 added 5.7 percent to the explanation of variance of student achievement and was also significant at  $p < .009$ . The null hypothesis concerning this association stated that there is no significant relationship between SCHLAC5 and student achievement. On the basis of the results presented above, this null hypothesis is rejected. Because only these two factors entered the multiple regression equation with a significance less than .05, the school factors SCHLAC1, SCHLAC3, SCHLAC4, SCHLAC6 did not contribute significantly in explaining variance in student achievement. Therefore, the next four null hypotheses (a) there is no significant relationship between SCHLAC1 and student achievement, (b) there is no significant relationship between SCHLAC3 and student achievement, (c) there is no significant relationship between SCHLAC4 and student achievement, and (d) there is no significant relationship between SCHLAC6 and student achievement were not rejected.

## CHAPTER V

### FINDINGS, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this chapter was to analyze the relative contribution of six socioeconomic status and three student perceptions of school effectiveness variables to variance in student achievement. The nine variables were (a) father's occupation, (b) mother's occupation, (c) father's schooling, (d) mother's schooling, (e) family income, (f) family's community population, (g) adequacy of curriculum and facilities, (h) teaching quality, and (i) quality of school services. Mother's occupation, however, was eliminated from the analysis because of insufficient data.

An instrument was developed for this study and was administered to senior engineering students from the Durango Institute of Technology in Mexico. The responses were then submitted to Pearson's correlation which provided information about the degree of multicollinearity among the variables. Actually, the analysis showed a very high degree of intercorrelation of all variables. In order to deal with this problem, the data were subjected to truncated component regression analysis (TCR). This analysis provided one socioeconomic factor and six school factors which are empirical representations (and no theoretical classification) of the socioeconomic status and student perceptions of school effectiveness variables. This smaller and orthogonal set of factors was then submitted to multiple regression analysis, the last step of the truncated component regression (TCR).



### Findings

The results indicated that there was a statistically significant relationship between socioeconomic and school factors and student achievement. It appears that socioeconomic and school factors (as determined by the varimax factor analysis) can explain a significant portion of the variance on student achievement. The multiple R for the relationship between these factors and student achievement was .428. However, only a very small portion of the variance in student achievement is explained by the general socioeconomic factor after the effect of the six school factors was removed.

Also, the results indicated that there was not a significant relationship between the socioeconomic factor and overall grade point average. The multiple R for the association between socioeconomic factor and student achievement was .099. It seems clear that socioeconomic status, in this study, does not explain any significant variance in academic achievement of senior engineering students.

Although all school factors are important in explaining student achievement in senior engineering students from the Durango Institute of Technology, only SCHFAC2 and SCHFAC5 made a significant relative contribution to the variance in student achievement. A statistically significant relationship between SCHFAC2 and SCHFAC5 and overall grade point average was found. The multiple R for this association was .403, and according to the multiple regression analysis, these two school factors explained over 16 percent of the variance in student achievement. The results indicated no statistically significant association between the overall grade point average and each one of the other school factors: SCHFAC1, SCHFAC3, SCHFAC4, and SCHFAC6.

### Limitations

A major limitation of this study was that the research was conducted on a sample of senior students from a higher education institution only. Such a situation might affect a priori the range of student achievement and, therefore, the degree of relationship between the independent variables and the dependent variable. Also, since the individuals in the study were involved in the process of graduation, associations between the factors studied, mainly the school factors, and student achievement might be different from associations where freshman, sophomore, and junior students had been included in the study.

The instrument used in this study was not subjected to any analysis of construct validity. Also, since reliability over time and predictive validity had not been established, the usefulness of the instrument appears to be limited.

There was very little variance in scores of some items, mainly in items asking for father's years of schooling, mother's years of schooling, and overall grade point average. This small variation in scores might reduce the sensitivity of the criterion and predictor variables. As a result, the relationship between the independent variables and student achievement might be restricted or be less than they would have been if greater variance had existed.

The data from the item father's occupation was scored according to Duncan's Socio-economic Index for Occupations.<sup>1</sup> Therefore, these data might be subjected to geographical/cultural biases since the

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<sup>1</sup>Otis Dudley Duncan, "A Socio-economic Index for All Occupations", Appendix, in Albert J. Reiss, with collaborators Otis Dudley Duncan, Paul K. Hatt, and Cecil C. North, Occupations and Social Status, (New York: Free Press, 1961).

information scored was obtained from a different population used as the base for determining the socioeconomic indexes. Had they been scored using a more suitable scale, different relationships might have resulted.

#### Implications

The following discussion is based on the statistical findings of this study. Differences in the findings of this study and others may be attributed to the study population. As stated earlier, the population of this study is different in some respects than others reported in previous studies. The implications drawn are as follows.

The combination of the socioeconomic factors and school factors (as defined in this study) was significantly related to student achievement. Therefore, this set of factors is an important variable influencing academic achievement in senior engineering students. However, the seven factors were expected to account for more than 18 percent of the variance in student achievement. The following are possible explanations of the failure to account for more variance in the dependent variables:

1. It is possible that the score used in data analysis as an indication of student achievement may not reflect a valid construct. Additional studies are needed to establish construct validity of that section.
2. It is possible that there may be other factors which may show a larger contribution to variance in student achievement. It may be that other social-psychological variables account for a larger variance in student achievement, i.e. motivation to study, student expectations, etc. Therefore, the question, "What is the strongest predictor of academic achievement in engineering students?" needs to be researched.

Although the set of factors representing socioeconomic and school factors was statistically significant, the amount of variance explained by the socioeconomic factor was so small that it brings into question its importance. It appears, then, that socioeconomic status as measured by father's occupation, father's schooling, mother's schooling, family income, and family's community population does not influence academic achievement of senior engineering students of the Durango Institute of Technology. Students from lower socioeconomic backgrounds do as well as students from higher socioeconomic backgrounds. This can probably be explained as the result of a family process; in other words, many low socioeconomic status students can be motivated to high achievement because of the social and psychological expectations of the family. However, the reasons for the lack of significance in regard to socioeconomic factors are difficult to determine.

The six school factors did explain, significantly, academic achievement in senior engineering students. However, only two were important in increasing the power of explanation of school factors. The two factors accounted for more than 16 percent of the variance in student achievement. Therefore, only these two school factors, professional preparation and personal encouragement, will be discussed below:

1. Based upon the results of this study it appears that an improvement in professional preparation and mathematics training supported by improved teaching and more interest in student learning, will most likely increase academic achievement in engineering students. Such a relationship needs further study. However, since an increased knowledge

of mathematics enhances professional preparation, the importance of implementation of such a program is evident in engineering students.

2. The results of the study indicate that independent study, supported by class discussion, small group activities, and encouragement to students, significantly influences academic achievement in engineering students. It appears, then, that the implementation of teaching techniques in which students can display some degree of independence in their process of learning will most likely improve their academic achievement.

Finally, our analysis demonstrates that school factors are important variables affecting learning in engineering students. However, this study does not explain how these school factors came to relate to academic achievement in engineering students.

#### Recommendations

As a result of the findings in this study, the writer suggests the following recommendations:

1. Areas of the curriculum encompassing professional training and mathematics need to be reinforced and supported by appropriate teaching techniques along with increased interest in the student as a learner.

2. Engineering education teachers and administrators should explore the use of techniques of teaching emphasizing independent study for learners in lieu of the lecture technique as a means of improving the academic achievement of students.

3. Additional research should be aimed at clarifying other characteristics of school that affect student achievement, including student and teacher characteristics.



APPENDICES

APPENDIX A

QUESTIONNAIRE

(For Research Purposed Only)

ALL RESPONSES WHICH YOU GIVE  
WILL BE KEPT STRICTLY CONFIDENTIAL

**PART I.** Please answer each of the following questions. If you are not sure about your answer, please give your best guess. Your information is very important.

1. Write the job titles of your parents.

FATHER: \_\_\_\_\_

MOTHER: \_\_\_\_\_

2. Check the number of years of schooling your parents completed.

FATHER		MOTHER
_____	1 - 3 years	_____
_____	4 - 6 years	_____
_____	7 - 9 years	_____
_____	10 -12 years	_____
_____	13 -15 years	_____
_____	16 -18 years	_____

3. Approximately, what is your parents' monthly income before taxes?

FATHER		MOTHER
_____	UNDER \$100	_____
_____	\$100 - \$199	_____
_____	\$200 - \$299	_____
_____	\$300 - \$399	_____
_____	\$400 - \$499	_____
_____	\$500 - \$599	_____
_____	\$600 - \$699	_____
_____	\$700 - \$799	_____
_____	\$800 - \$899	_____
_____	\$900 - \$999	_____
_____	OVER \$1000	_____

OVER PLEASE!

4. What is the population of your parents' community?

- \_\_\_\_\_ Under 1000
- \_\_\_\_\_ Between 1000 and 10000
- \_\_\_\_\_ Between 10001 and 50000
- \_\_\_\_\_ Between 50001 and 100000
- \_\_\_\_\_ Over 100000

5. Please estimate your grade point averages using the following scale:

- |                |                   |
|----------------|-------------------|
| a. 7.0 or less |                   |
| b. 7.1 - 7.5   | _____ Mathematics |
| c. 7.6 - 8.0   | _____ Major       |
| d. 8.1 - 8.5   | _____ Overall     |
| e. 8.6 - 9.0   |                   |
| f. 9.1 - 9.5   |                   |
| g. 9.6 - 10.0  |                   |

**PART II.** This section is divided into various areas associated with teaching and services at Institute. To the right of each guiding statement is a set of numerical values (1,2,3,4,5,6). These values correspond to certain alternatives given in a scale for each item. Please circle the number which most nearly indicate your perceptions for each item (evaluate each item whether you practice it or not), according to the following scale:

- (1) bad
- (2) poor
- (3) fair
- (4) good
- (5) very good
- (6) excellent

1. According to your experiences, indicate the adequacy of training you have received from the Institute.

- |                               |   |   |   |   |   |   |
|-------------------------------|---|---|---|---|---|---|
| a. Professional training..... | 1 | 2 | 3 | 4 | 5 | 6 |
| b. College Mathematics.....   | 1 | 2 | 3 | 4 | 5 | 6 |
| c. Field practices.....       | 1 | 2 | 3 | 4 | 5 | 6 |

2. How would you rate the teaching quality of teachers in your college?

- |                       |   |   |   |   |   |   |
|-----------------------|---|---|---|---|---|---|
| Teaching quality..... | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------------------|---|---|---|---|---|---|



3. According to your learning, how would you rate the teaching methods of your college teachers?
- |  |   |   |   |   |   |   |
|--|---|---|---|---|---|---|
| a. Lectures.....                             | 1 | 2 | 3 | 4 | 5 | 6 |
| b. Class discussions.....                    | 1 | 2 | 3 | 4 | 5 | 6 |
| c. Audiovisual materials.....                | 1 | 2 | 3 | 4 | 5 | 6 |
| d. Learning by doing (labs, shops, etc.).... | 1 | 2 | 3 | 4 | 5 | 6 |
| e. Small group activities.....               | 1 | 2 | 3 | 4 | 5 | 6 |
| f. Independent study/research projects.....  | 1 | 2 | 3 | 4 | 5 | 6 |
4. Please rate the following characteristics of your college teachers.
- |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| a. Interest in student learning.....                        | 1 | 2 | 3 | 4 | 5 | 6 |
| b. Encouragement to students about professional future..... | 1 | 2 | 3 | 4 | 5 | 6 |
| c. Availability for extra-help.....                         | 1 | 2 | 3 | 4 | 5 | 6 |
5. How would you rate the knowledge of your teachers?
- Teacher knowledge.....1 2 3 4 5 6
6. Rate the college facilities and equipment according to how well they are related to the future necessities of the professional job.
- Facilities and equipment.....1 2 3 4 5 6
7. Please rate the quality of services and of the following functions at college.
- |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| a. Job placement.....                   | 1 | 2 | 3 | 4 | 5 | 6 |
| b. Counseling in personal problems..... | 1 | 2 | 3 | 4 | 5 | 6 |
| c. Help in making career decisions..... | 1 | 2 | 3 | 4 | 5 | 6 |
| d. Tutoring services.....               | 1 | 2 | 3 | 4 | 5 | 6 |
| e. Learning lab. and packages.....      | 1 | 2 | 3 | 4 | 5 | 6 |
| f. Athletic programs.....               | 1 | 2 | 3 | 4 | 5 | 6 |
| g. Recreational programs.....           | 1 | 2 | 3 | 4 | 5 | 6 |
| h. Library.....                         | 1 | 2 | 3 | 4 | 5 | 6 |
| i. Health services.....                 | 1 | 2 | 3 | 4 | 5 | 6 |

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THANK YOU FOR ASSISTING US IN OUR STUDY.

APPENDIX B

CUESTIONARIO

(Para fines de Investigación Solamente)

TODAS LAS RESPUESTAS SE GUARDARAN CONFIDENCIALMENTE

PARTE I. Por favor conteste cada una de las siguientes preguntas. Si no esta seguro de su respuesta, seleccione la alternativa mas probable. No deje de contestar ninguna pregunta.

1. Escriba los nombres de las ocupaciones de sus padres.

PADRE: \_\_\_\_\_

MADRE: \_\_\_\_\_

2. Marque el numero de años de estudios que sus padres realizaron:

PADRE		MADRE
_____	1 - 3 años	_____
_____	4 - 6 años	_____
_____	7 - 9 años	_____
_____	10 -12 años	_____
_____	13 -15 años	_____
_____	16 -18 años	_____

3. Aproximadamente ¿Cual es el salario mensual de sus padres?

PADRE		MADRE
_____	\$ 5000 o menos	_____
_____	\$ 5001 - 10000	_____
_____	\$10001 - 15000	_____
_____	\$15001 - 20000	_____
_____	\$20001 - 25000	_____
_____	\$25001 - 30000	_____
_____	\$30001 - 35000	_____
_____	\$35001 - 40000	_____
_____	\$40001 - 45000	_____
_____	\$45001 - 50000	_____
_____	Más de 50000	_____

4. Aproximadamente, ¿ Cual es la poblacion del lugar de residencia de sus padres?

- ☐ Menos de 1000 habitantes
- ☐ Entre 1000 y 10000 hbts.
- ☐ Entre 10001 y 50000 hbts.
- ☐ Entre 50001 y 100000 hbts.
- ☐ Más de 100000 hbts.

5. Por favor estime sus diferentes promedios de calificaciones de acuerdo a la siguiente escala:

- a. 7.0 o menos
  - b. 7.1 - 7.5
  - c. 7.6 - 8.0
  - d. 8.1 - 8.5
  - e. 8.6 - 9.0
  - f. 9.1 - 9.5
  - g. 9.6 -10.0
- ☐ promedio en matemáticas  
☐ promedio en especialidad (mecánica, producción, etc.)  
☐ promedio general

PARTE II. Esta parte esta dividida en varias áreas las cuales estan asociadas con la enseñanza y los servicios del Tecnológico. A la hay una serie de valores numericos (1,2,3,4,5,6) los cuales corresponden a una escala. Por favor clasifique las siguientes afirmaciones, encerrando en un círculo el número correspondiente, de acuerdo a la siguiente escala:

(1) pésimo  
 (2) malo  
 (3) regular  
 (4) bueno  
 (5) muy bueno  
 (6) excelente

1. De acuerdo a sus experiencias, indique que tan apropiado ha sido el entrenamiento que usted ha recibido en el Instituto.

- a. Entrenamiento Profesional.....1 2 3 4 5 6
- b. Entrenamiento en Matemáticas.....1 2 3 4 5 6
- c. Instrucción en Laboratorios.....1 2 3 4 5 6
- d. Practicas de Campo.....1 2 3 4 5 6

2. Clasifique a los profesores del Tecnológico de acuerdo a su calidad en la enseñanza.

Calidad en la enseñanza.....1 2 3 4 5 6

3. En relación a su aprendizaje en el Tecnológico, clasifique las técnicas de enseñanza de sus profesores.

- |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| a. Método Tradicional (conferencia).....                    | 1 | 2 | 3 | 4 | 5 | 6 |
| b. Discusión en clase.....                                  | 1 | 2 | 3 | 4 | 5 | 6 |
| c. Instrucción Audiovisual.....                             | 1 | 2 | 3 | 4 | 5 | 6 |
| d. Aprendiendo Haciendo (laboratorio/<br>prácticas).....    | 1 | 2 | 3 | 4 | 5 | 6 |
| e. Actividades grupos pequeños (equipos)...                 | 1 | 2 | 3 | 4 | 5 | 6 |
| f. Estudio Independiente/Proyectos de<br>investigación..... | 1 | 2 | 3 | 4 | 5 | 6 |

4. Clasifique las siguientes actitudes de los profesores.

- |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| a. Interés en el aprendizaje de los<br>alumnos..... | 1 | 2 | 3 | 4 | 5 | 6 |
| b. Estímulo hacia el futuro profesional....         | 1 | 2 | 3 | 4 | 5 | 6 |
| c. Disponibilidad para ayuda extra-clase...         | 1 | 2 | 3 | 4 | 5 | 6 |

5. ¿Como clasificaría el conocimiento que los profesores tienen en su campo de enseñanza?

Conocimiento de los profesores.....1 2 3 4 5 6

6. Clasifique las facilidades y equipo del Instituto de acuerdo a que tan apropiadas (o adecuadas) son para cubrir las futuras necesidades del trabajo profesional.

Equipo, maquinaria y facilidades.....1 2 3 4 5 6

7. Por favor clasifique la calidad de los siguientes servicios del Instituto.

- |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| a. Bolsa de Trabajo.....                                | 1 | 2 | 3 | 4 | 5 | 6 |
| b. Asesoría en problemas personales.....                | 1 | 2 | 3 | 4 | 5 | 6 |
| c. Asesoría en selección de especialidad...             | 1 | 2 | 3 | 4 | 5 | 6 |
| d. Asistencia en problemas académicos.....              | 1 | 2 | 3 | 4 | 5 | 6 |
| e. Apuntes mimeografiados/Centro de<br>Aprendizaje..... | 1 | 2 | 3 | 4 | 5 | 6 |
| f. Programas deportivos.....                            | 1 | 2 | 3 | 4 | 5 | 6 |
| g. Programas recreativos.....                           | 1 | 2 | 3 | 4 | 5 | 6 |
| h. Biblioteca.....                                      | 1 | 2 | 3 | 4 | 5 | 6 |
| i. Servicios médicos.....                               | 1 | 2 | 3 | 4 | 5 | 6 |

GRACIAS POR SU AYUDA EN ESTE ESTUDIO.

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